

The Joint Space Operations Center (JSpOC) Mission System (JMS) and the Advanced Research, Collaboration, and Application Development Environment (ARCADE)

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The JSpOC Mission System (JMS) is a modern service-oriented architecture (SOA) infrastructure with increased process automation and improved tools to enhance Space Situational Awareness (SSA). The JMS program has already delivered Increment 1 in April 2013 as initial capability to operations. The program's current focus, Increment 2, will be completed by 2016 and replace the legacy Space Defense Operations Center (SPADOC) and Astrodynamics Support Workstation (ASW) capabilities. Post 2016, JMS Increment 3 will continue to provide additional SSA and C2 capabilities that will require development of new applications and procedures as well as the exploitation of new data sources with more agility.

In 2012, the JMS Program Office entered into a partnership with AFRL/RD (Directed Energy) and AFRL/RV (Space Vehicles) to create the Advanced Research, Collaboration, and Application Development Environment (ARCADE). The purpose of the ARCADE is to: (1) serve as a centralized testbed for all research and development (R&D) activities related to JMS applications, including algorithm development, data source exposure, service orchestration, and software services, and provide developers reciprocal access to relevant tools and data to accelerate technology development, (2) allow the JMS program to communicate user capability priorities and requirements to developers, (3) provide the JMS program with access to state-of-the-art research, development, and computing capabilities, and (4) support JMS Program Office-led market research efforts by identifying outstanding performers that are available to shepherd into the formal transition process.

AFRL/RV and AFRL/RD have created development environments that together allow developers to develop applications and work with data sources. The ARCADE Portal gives developers a sandbox environment to test and benchmark new algorithms and services and is currently available over internet using a CAC or Kerberos using Yubikey. The ARCADE SOA is hosted on restricted networks that allow new applications to be integrated with the JMS SOA and other data sources to help mature the capability to TRL 6.

1. JMS ACQUISITION IMPERATIVES

The JMS program is working to bring new SSA tools to the user in a much more agile manner than the current acquisition process allows. This will enable timely deployment of capabilities to the user in order to be more responsive to space events. The former commander of Air Force Space Command, General William L. Shelton, stated [1]:

“The JMS program will have a huge impact on just about everything we do in space. Acting as the hub, JMS will revolutionize Space Situational Awareness capabilities, taking inputs from a huge variety of radar and optical, ground- and space-based, space weather, and many other types of sensors. JMS is a great example of how an industrial age acquisition system just isn't agile enough for an information age program. The system is too slow, too stodgy, and the requirements it places on program developers are too cumbersome. Streamlined acquisition requires everyone to streamline their expectations and process.”

General Shelton gave the keynote address at the AMOS conference in 2012. During the keynote, a conference member asked how the SSA community could bring capabilities to Space Command faster. General Shelton's reply was, “You need to bring those new capabilities through the JMS R&D Environment.” Since the time of the 2012 AMOS conference, the JMS R&D Environment was formally launched into the ARCADE effort.

Colonel Mike Wasson, former Chief, Combat Operations Division, 614th Air and Space Operations Center, stated [2]:

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“The JSpOC requires highly responsive SSA capabilities that rapidly detect, track, and characterize objects in space. As such, new developments in SSA tools and capability to assess and respond to events in space are imperatives for the future.”

To address both of these statements, AFRL and the JMS program proposed the development of an application development environment that would give future capability developers access to a common environment as a step in achieving a streamlined acquisition process for new SSA tools. The environment will help facilitate the development of high-impact applications in a timely manner as well as help bridge the gap between development and integration into the operational JMS enterprise by exercising the developed applications in a relevant environment with representative data sets. The Advanced Research Application Collaboration Environment (ARCADE) Program was initiated in 2014 by AFRL as a cross directorate Directed Energy (AFRL/RD) and Space Vehicles (AFRL/RV) effort to build the necessary development tools and environment for development testing.

2. HIGH-LEVEL JMS ACQUISITION APPROACH

The JMS is designed to deliver an integrated, net-centric SSA and C2 capability, with a space User Defined Operational Picture (UDOP) and mission services which support and enable the missions of the Commander Joint Forces Component Command for Space (CDR JFCC SPACE). CDR JFCC SPACE requires the ability to protect space capabilities supporting US, allied, and coalition operations. This requires operationally-relevant SSA and integrated C2 of Space Control capabilities.

The JMS program is being executed by the Space and Missile Systems Center Space Superiority Systems Directorate (SMC/SY) for the Program Executive Officer for Space (PEO Space). The JMS program is leveraging investments in existing government prototype efforts and existing industry applications to rapidly deliver needed capabilities. It will deliver capabilities to get off legacy SPADOC and ASW through two increments which leverage these mature capabilities by the end of FY14. Once this is accomplished, the JMS system will have the necessary capabilities and framework upon which additional SOA-compliant capabilities can be easily added in the Post-Increment 2 time period. The JMS program office will act as the system architect and as the integrator and maintainer of the JMS system baseline.

Increment 1 (2011-2013): Increment 1 leverages capabilities that have already been developed. It builds on the AFRL JMS prototype known as Capability Package 0 (CP0). CP0 was developed, tested, and deployed in close cooperation with the JSpOC user community. It provides automated links to existing data sources and includes a UDOP to integrate and display the information. CP0 also provides the baseline JMS SOA. The CP0 prototype has been incrementally improved through Service Packs (SPs). SPs aggregate applications of capability developed, integrated, tested, and deployed in approximately 3-month cycles with odd numbered SP's delivering new capability and even numbered SP's largely containing only IA updates. CP0 plus SPs 1 through 5 complete Increment 1, which will satisfy two of the five JMS Capability Description Document (CDD) Key Performance Parameters (KPP), namely UDOP and Net-centricity.

Increment 2 (2013-2016): Increment 2 will build upon the Increment 1 baseline, satisfy the remaining 3 JMS CDD KPPs (Space Catalog, Orbital Conjunction, and Ops Availability) and allow decommissioning of the legacy SPADOC hardware by the end of FY 2015. Increment 2 integration, test, and sustainment will be managed by the Space and Naval Warfare Systems Command (SPAWAR) San Diego as part of the JMS program office. The content of Increment 2, number and type of contracts used to acquire Increment 2 services for integration by SPAWAR, and timing of Increment 2 SP releases will be determined based on Increment 1 capability, program lessons learned, and maturity of industry and government applications.

Increment 3 (2016+): At the completion of Increment 2, JMS will have delivered a flexible, extensible SOA framework with foundational services (such as catalog and conjunction services) upon which additional SSA capabilities can be added. During this phase, the JMS program office will rely on the JSpOC user and the Requirements & Planning Council (R&PC) co-chairs (CDR JFCC SPACE and PEO Space) to establish and continually refine capability priorities. The JMS program will communicate these priorities to the application development community with regular updates to focus application developments on the most important user needs. SPAWAR will continue as part of the JMS program office in the role of software integration and sustainment of the JMS baseline.

The buildup of the ARCADE began during Increment 2. Existing projects such as Ibex (a joint DARPA/AFSPC effort leveraging expertise at AFRL and MIT LL), the GEO Odyssey program, DARPA Orbit Outlook, space weather services can take advantage of this initial buildup to help develop, test, and collaborate in a virtual-computing environment, from physically different parts of the country. The JMS program will work with AFRL on this initial infrastructure to turn the initial ARCADE services into a worldwide asset for SSA tool development by the time JMS enters the Increment 3 time period.

3. BASELINE FRAMEWORK

JMS SOA: The JMS program completed an assessment using inputs from Industry, SPAWAR, and multiple Federally Funded Research and Development Centers (FFRDCs) which concluded that the current CP0 SOA architecture provides a suitable, low-risk solution on which to build JMS. The PEO SPACE signed the JMS SOA Decision Report on 20 Jan 2012 to formalize the SOA framework for future Increments of JMS.

SOAs are built as loosely-coupled systems consisting of infrastructure components and applications that are orchestrated to provide defined capabilities. Typically, SOAs are designed using standard commercial off the shelf/free and open source software (COTS/FOSS) products and are tailored to specific mission needs [3]. The key components of a standard SOA design are: the enterprise service bus, the service registry and repository, service orchestration, event management, data management, and security. Each of these components is tailored to support mission specific requirements. For example, to meet particular mission requirements a system may require unique data and service models or may have unique security needs.

The JMS infrastructure provides a suite of components and implements a set of standards to support mission services. To effectively integrate into the SOA infrastructure, an application developer must understand various components of the infrastructure. The following is a list of the JMS infrastructure components:

- Security
- Messaging
- Collaboration Support
- Enterprise Service Bus & Java Enterprise Edition (JEE) Application Server
- Data Management
- UDOP Framework
- General Support and Components

JMS UDOP: The JMS UDOP is an application authoring tool that combines data with process and display components to enable the creation and operation of application views. The base implementation of the UDOP provides a set of generic components for visualization, process control, and data access.

Each JMS mission application must interface with the UDOP to display information to the user. Fig 1 shows the current welcome screen for a JMS UDOP. From there, a user can access a wealth of applications for the various JSpOC mission areas.



Fig. 1: JMS UDOP Welcome Perspective

Application developers may add to the list of UDOP components that are available by building custom visualization, process, and data access plug-ins. Detailed standards for integration and best practices regarding the development of 3rd party UDOP plug-ins are outlined within the JMS UDOP software development kit (SDK). This document will be made available to application developers through the development environment.

When integrating with the JMS UDOP, the application developer defines a UDOP Document. The UDOP Document is a definition document that contains the structure of the visualization components, the data sources available, and the process information used to tie the data to the visualization components. The document may also contain images, static data, historical data, or other resources. The visualization components within a UDOP Document are grouped into one or more perspectives. A perspective is a collection of visual components that are displayed together. The visual components contained by a perspective are views, menus, and toolbars. A view is a component used to visualize and navigate a collection of data. Multiple views may be used to provide different visualization and navigation for the same collection of data.

The UDOP Authoring Tool, shown on the left of Fig 2, is an example of a development tool that will be available to users of the development environment. The tree entry for the Space Order of Battle perspective is expanded in the figure (on the left) as an example. The child nodes under the Space Order of Battle entry identify the gadgets and views placed in the perspective. The components shown on the left of Fig 2 trace to the example of the Space Order of Battle perspective shown on the right side of the figure.

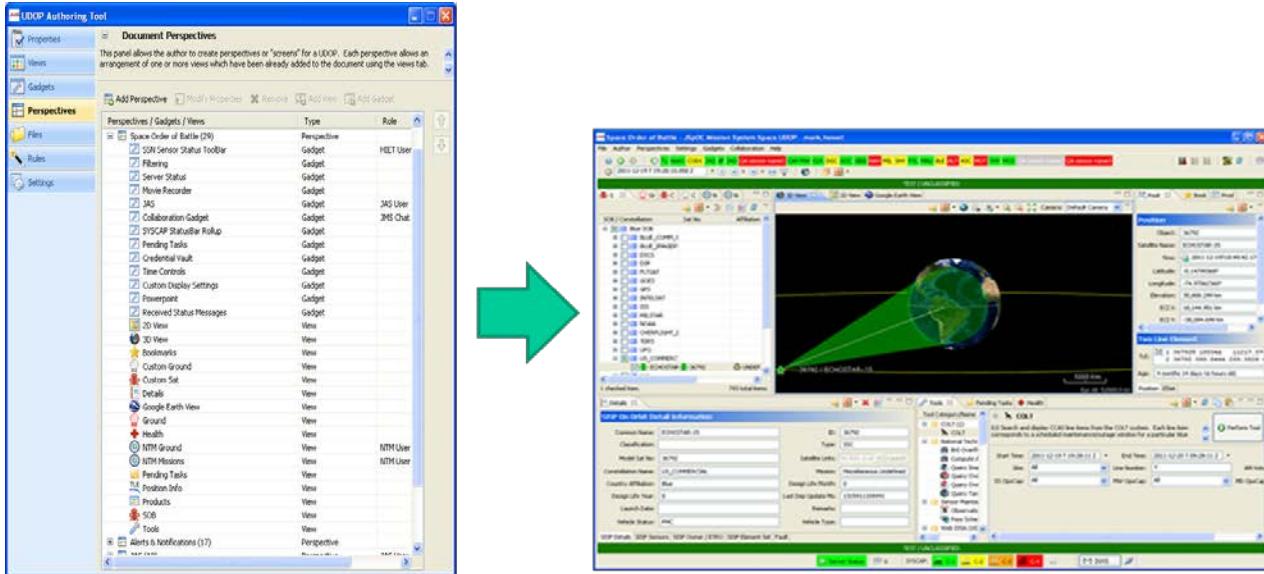


Fig. 2: JMS UDOP Authoring Tool and Space Order of Battle Perspective

4. KEY ELEMENTS OF THE ARCADE

Overview: AFRL and the JMS program are partnering to develop the ARCADE. The end state of this environment will give various user groups (e.g., software developers, SSA experimenters, and JSpOC users) the documentation, building block JMS services, modeling and simulation tools, relevant test scenarios, data sources, JMS user requirements/priorities, SOA integration tools required to support JMS development, and establish a structured Governance Process. The environment will also provide these user groups with a framework that enables and encourages multi-organizational collaboration. This environment is envisioned as a means for the JMS program to become a more agile acquisition system that accelerates the delivery of prototypes into SPs.

Although this environment is not a so-called cloud computing paradigm it is being implemented in a manner that shares characteristics of well-known computing clouds, such as Amazon's Elastic Compute Cloud or Google's Compute Engine. These characteristics include:

- **Infrastructure as a Service:** JMS ARCADE will provide computational storage and networking resources available on demand
- **Platform as a Service:** JMS ARCADE will provide the JMS SOA and SDK; AFRL will investigate methods to optimally integrate SOA technologies with Cloud technology
- **Software as a Service:** JMS ARCADE will provide all the development tools needed to build a JMS-compatible service as well as modeling and simulation tools for SSA experiments
- **Data as a Service:** JMS ARCADE will provide both canned and real data sources to application developers and SSA experimenters formatted according to data standards as defined by the JMS common data model

The JMS development environment will provide some or all of these services as applicable to each type of user. User profiles will catalog each user attribute according to the type of service required.

MHPCC Portal-based Application Development Environment Foundation: AFRL is making upgrades and expansions to existing network environments as the foundation of the JMS application development environment. For the unclassified environment, which is critical to the application developer user segment, JMS will leverage the existing DOD High Performance Computing Modernization Program (HPCMP) Portal capability developed at the Maui High Performance Computing Center (MHPCC) and JMS technologies developed within the AFRL/RV Battlespace Evaluation and Assessment SSA Testbed (BEAST). The HPC portal capability is easily accessible through the Internet, leverages existing hardware, account management, and user support services. It currently uses

PKI-CAC and Yubikey authentication, which allows DOD and DOD contractors to access HPCMP systems via the Internet and modern web browser with no additional user-side software requirements.

The ARCADE Portal was designed to provide the ability for users to develop, integrate, and evaluate services prior to SOA integration. As shown in Fig. 5, the ARCADE Portal chiefly provides:

- JMS software development kits and resources
- A suite of software development tools including terminal, integrated development environments, editors, compilers, debuggers, and configuration management applications
- File transfer capabilities
- A Workflow tool for service generation and testing of services

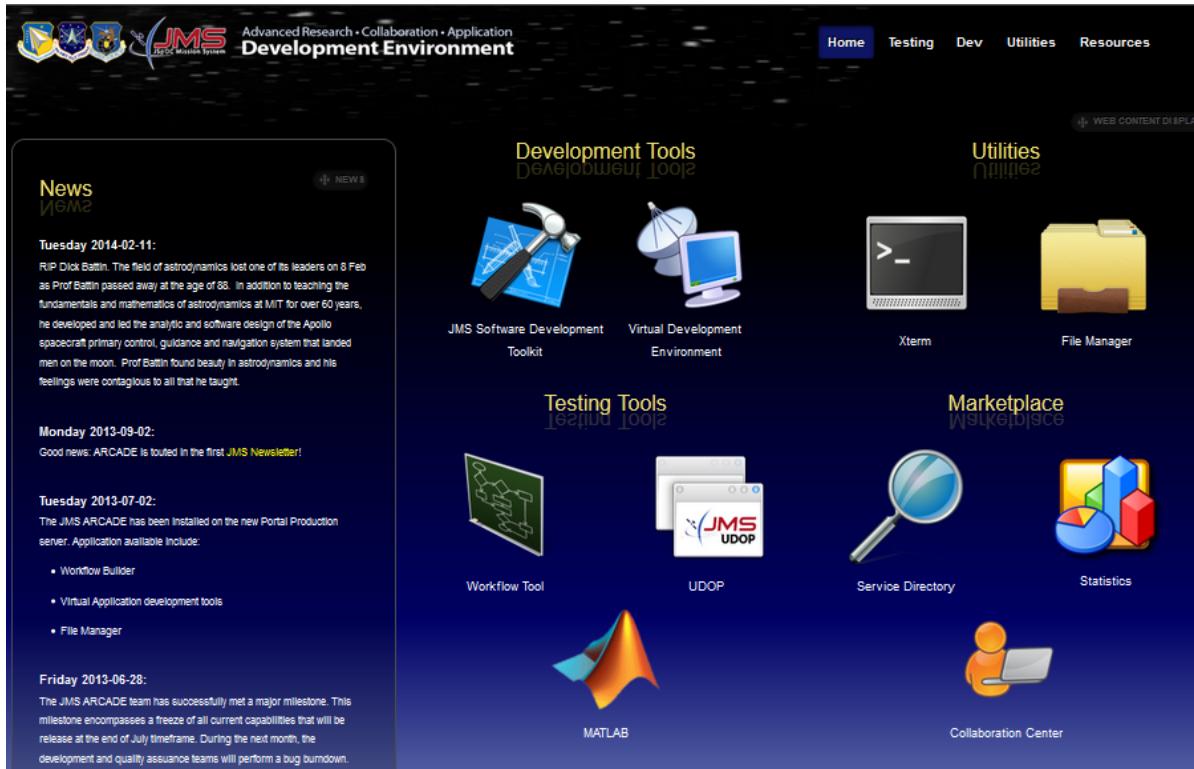


Fig. 4: The ARCADE Portal Home Page

The Workflow tool is likely the most important part of the ARCADE Portal. It enables two capabilities 1) generation of service wrappers, and 2) testing of services in system-of-systems scenarios. One of the challenges for scientist and engineers when working with JMS is lack of SOA knowledge. Almost all technology developers can provide stand-alone applications that take input as command line arguments or from files and provide output to files or standard out. The ARCADE Portal Workflow tool provides a basic mechanism for developers to create JMS-compatible service wrappers around applications like these, provided the applications use standard data inputs and outputs. This is expected to be a huge enabler for scientist and engineers to create JMS SOA ready services without having to understand SOA technology or java programming.

Once a service is generated, it can be tested in a closed-loop scenario with other data processing components to gage how well the new service impacts the overall system. The current workflow tool is limited to the cataloging process, as shown in Fig. 5, with components for:

- Input- generates the “truth” data for simulations
- Scheduler- tells the sensors when and where to look for simulations
- Observation Generator- this generates sensor observations

- Correlator- this compares the sensor observations against the known catalog
- UCT Resolution- associates uncorrelated tracks (UCTs) and build new catalog entries
- Catalog Update- updates the catalog given correlated observations

Efforts are underway to add Indications and Warnings and Command and Control components to the workflow. The user can assign a given service to each of these components. The services can be hosted within the ARCADE Portal computing environment or externally hosted. Once execution begins, the services are called in sequence at defined time steps until the scenario time is completed. Intermediate and output files are available for on-line viewing or for download. Efforts are underway to provide pre-configured scenarios in which a developer can test their services and compare results against performance benchmarks. The JMS program can then use these performance benchmarks when deciding whether to acquire a given service.

With benchmarking in mind, the Workflow tool was designed to work primarily with simulations; however, real data observation generation services have been demonstrated. The dynamic nature of the scenarios becomes moot with real data since the system cannot direct future data collection based upon present processing. For simulation scenarios, care has been taken to implement truth generation with six degree of freedom special perturbations trajectory modeling, relevant satellite material models, and state of the art sensor simulation (currently limited to optical sensors).

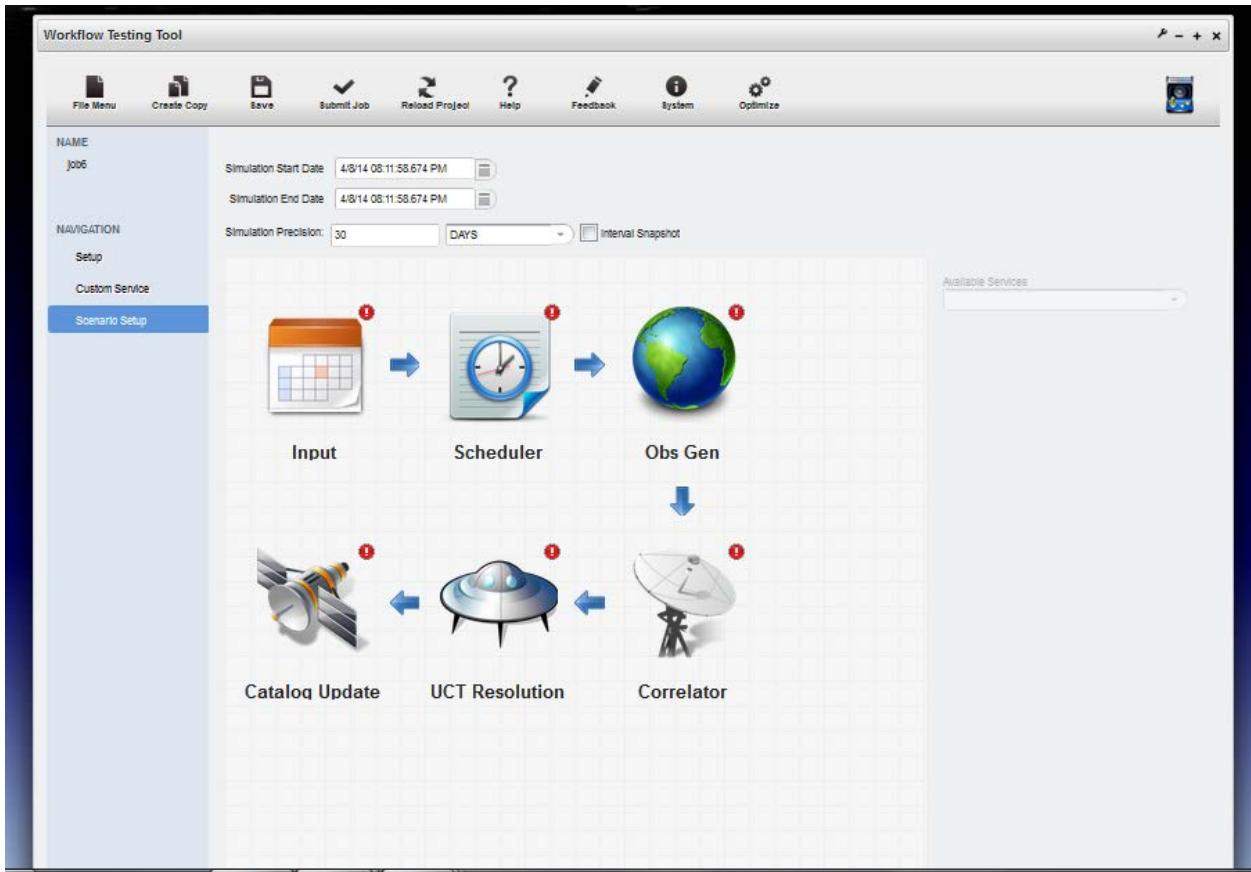


Fig. 5: The ARCADE Portal Workflow Tool Scenario Set-Up

To recap the role of the ARCADE Portal, consider a person who has an idea on how to improve SSA, whether its building a new sensor or a smarter way to manage data collection or data exploitation. The ARCADE Portal provides software development tools for that person to develop an application from that idea. The Workflow tool then allows the person to wrap that application as a JMS-compatible service. Then the impact that service has on relevant scenarios can be quantified using the Workflow tool as well. The person only needs a web-browser and the ability to build their application.

Additional information on the Portal ARCADE can be found at (<https://www.mhpcc.hpc.mil/portal/arcade>). Efforts are currently underway to host the ARCADE Portal at the classified level as well.

JMS SOA BASED DEVELOPMENT ENVIRONMENT:

Due to the restricted nature of JMS data sources, the services of which are an integral part of the JMS infrastructure, only on restricted enclaves of ARCADE will host the JMS SOA for software application developers to interact with. The decision to only host the JMS SOA in a restricted computing environment may be reversed in the future, but there are policy issues that must be sorted through prior to release of the JMS SOA at an open level. Although access to the computing networks severely limits the communities who may access the restricted portions of ARCADE, still there is a broad community of government, industry, and academia who can access these restricted ARCADE enclaves, and participate in both software development, collaboration, and research, with the JMS SOA. To be specific, the JMS SOA supplied on ARCADE is a near-copy of the JMS SOA that is currently operational. The JMS SOA available thru ARCADE provides access to user groups that range from large industry to rapid prototyping shops in academia, government, and small business (as shown in Fig. 6) and will protect the intellectual property rights of these users through roles defined within the SOA's underlying security system. The controls will also give JMS personnel the accesses necessary to review prototypes while in the development and integration phases. This review may support JMS market research efforts and allows the JSpOC operators to get early exposure to development applications as well as give government experts the opportunity to provide feedback to the developer on usability, the viability of the processing algorithms, scalability to relevant or operationally-sized data feeds, and more.

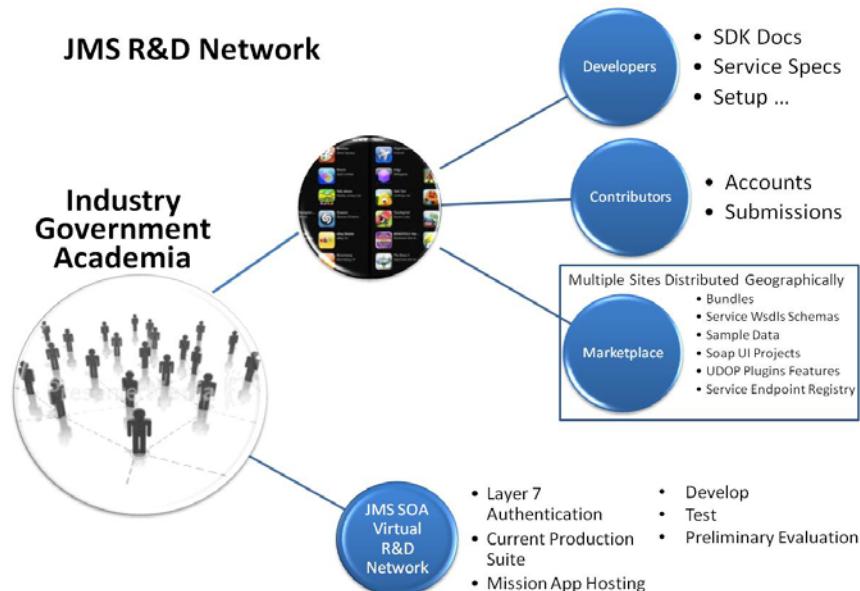


Fig. 6: Features of the JMS ARCADE on a Network

Transition to Operations:

The mission application path to transition will incorporate a phased progression from development to operations. Through ARCADE emphasis is placed on maturation of applications up to TRL 6 (see Fig. 7). Technical Readiness Levels 6-9 are all defined relative to an operational environment, in this case the currently operational version of JMS. After maturation in ARCADE if an application is deemed a viable candidate for JMS inclusion and after appropriate security checks and contracting requirements are completed the candidate application will be transitioned to the JMS Enterprise Development and Integration (JEDI) environment, which is the official integration environment hosted by SPAWAR. In the JEDI there is a gating process, after which, if the candidate application graduates, and the application progresses to the Mission Integration Enclave (MIE). The MIE is a testing

environment, co-located with the JSpOC, where the 46th Test Squadron performs official Development Testing and Operational Testing. Once the candidate application goes through the MIE it is assessed at TRL 8. An assessment of TRL 9 is only possible if an application is employed in operations, JSpOC operations.

The described process of transition is complicated, which is one reason for creation of the ARCADE test-bed, in order to supply developers with the necessary knowledge, software development kits, exposure to test data sources, and environment such that candidate applications are at a sufficient level of technical maturity to facilitate transition through the subsequent steps, JEDI and MIE integration and testing. Whereas the barrier to entry for the JEDI and MIE are quite high, the barriers to entry into ARCADE are very low by comparison. ARCADE accounts, at the appropriate classification level are currently being approved for any US Government, US Government Contractor, or DoD CRADA members who apply. ARCADE or ARCADE-like services may be extended in the future to foreign partners and academia. Software development kits, test-data, and a copy of the JMS environment are all included with ARCADE accounts at the appropriate classification levels. More about the ARCADE governance process is described in the next sub-Section. A downside to this migration approach is that there are multiple development environments to develop, deploy, and maintain. However, the transition is believed to be the most agile means to acquire and deploy mission applications as well as the best strategy to mobilize the broadest possible community of developers and experimenters. Accessibility is a fundamental strength of this approach.

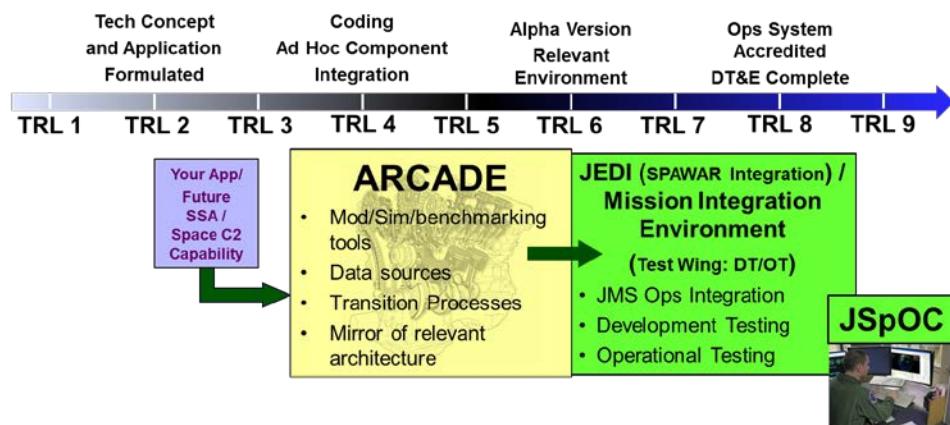


Fig. 7: ARCADE-JMS Tech Maturation Process

ARCADE Governance Process

Governance refers to the mechanism, processes, roles and responsibilities by which the ARCADE Program and Key Stakeholders maintain control over the process of software application maturation. The Governance of ARCADE is still in a draft format, planned to be completed by September 2015. The ARCADE Governance Process is currently directed by the ARCADE Governance Board, chaired by the senior-level officials from key Government stakeholders: AFRL, SMC/SY, and the JSpOC. The senior-level ARCADE Governance Board meets biannually; assumes responsible for the overall Governance process; assesses the ARCADE Program's value, plans, and goals; and assists with Application transition by formulating recommendations to the JMS Requirements and Planning Council.

In addition to directing the ARCADE Governance process at the Board level, the key Government stakeholders—AFRL, SMC/SY, and JSpOC—perform work at the execution level. As ARCADE host, AFRL supplies assistance and may, upon request, furnish evaluations of Application development in four main areas: Information Assurance, System Engineering, Military Utility, and Info Veracity. The JMS Program Office (SMC/SY) is the transition agent and additionally performs independent evaluation on the subjects of Information Assurance, System Engineering, Military Utility, and Info Veracity. Part of the formal Governance process is to segregate the parts of AFRL where they may serve as an S&T application developer from roles as the ARCADE host. As such, the JMS Program Office performs independent evaluations in order to avoid conflicts of interest due to the fact that AFRL is both host and developer of technologies. Furthermore, it is planned that in September 2015 the overall Governance and

evaluation portion of ARCADE will transition to SMC/SY. It is planned that evaluations will be tiered. For example, a System Engineering assessment will be Tiered with the lowest Tier being unassessed and the highest being fully compatible, proven by test running on live test-data feeds with the JMS SOA and if applicable JMS UDOP. Military Assessment will be handled with a similar Tiered grading scheme, with highest weight placed on the JSPOC's evaluation of a technology; the JSPOC, the operational stakeholder is uniquely qualified to assess Military Utility of a technology. Thus far the most challenging assessment to define and staff is the need for Info Veracity. The proposed Tiered approach is that the highest-Tier assessment will be documented by successful comparison of an application results with benchmarks accepted by a Community of Interest. For orbital determination algorithms there are benchmarking tools, with varied levels of acceptance in the Astrodynamics Community of Interest, and importantly the MHPC Portal ARCADE currently hosts some and has capability to host more simulation tools for these benchmarking purposes. Unfortunately similar benchmarks are not available for all algorithm technologies, for example the Community of Interest for Space Environmental Effects does not currently and may never possess such benchmarks. Proposed middle-Tier Information Veracity assessment is evaluation with quantifiable measures by an independent evaluator and proposed lower-Tier assessment is qualitative evaluation by an independent evaluator. Both of these assessments are essentially peer-review processes as higher and lower levels of rigor. Although the ARCADE Program recognizes the need to assess the truthfulness of information offered to JSPOC operators, the ARCADE Program does not currently have the resources nor expertise to perform peer-review for all conceivable algorithm technologies. It is important to note that Information Veracity is for ARCADE purposes only, and the language Information Veracity assessment is used purposefully instead of Verification because official Validation and Verification is performed by the Test Authority, the 46th Test Squadron. In all evaluations the base-level assessment will be reserved for unassessed technologies.

AFRL as the ARCADE Host, the JMS Program Office in its cardinal role as transition agent, and the JSPOC as recipients of ARCADE-matured software applications represent three primary Government stakeholders for ARCADE. The fourth, last but *not* least important role in the ARCADE paradigm is that of Application Developer. Application developers may be from Small Business, Industry, Government Labs to include Federally Funded Research and Development Centers, and Academia. The ARCADE Governance Process describes the roles of Application Developers in ARCADE for the purposes of defining what support an Application Developer may expect and a model for how application installation, maturation, and transition may proceed.

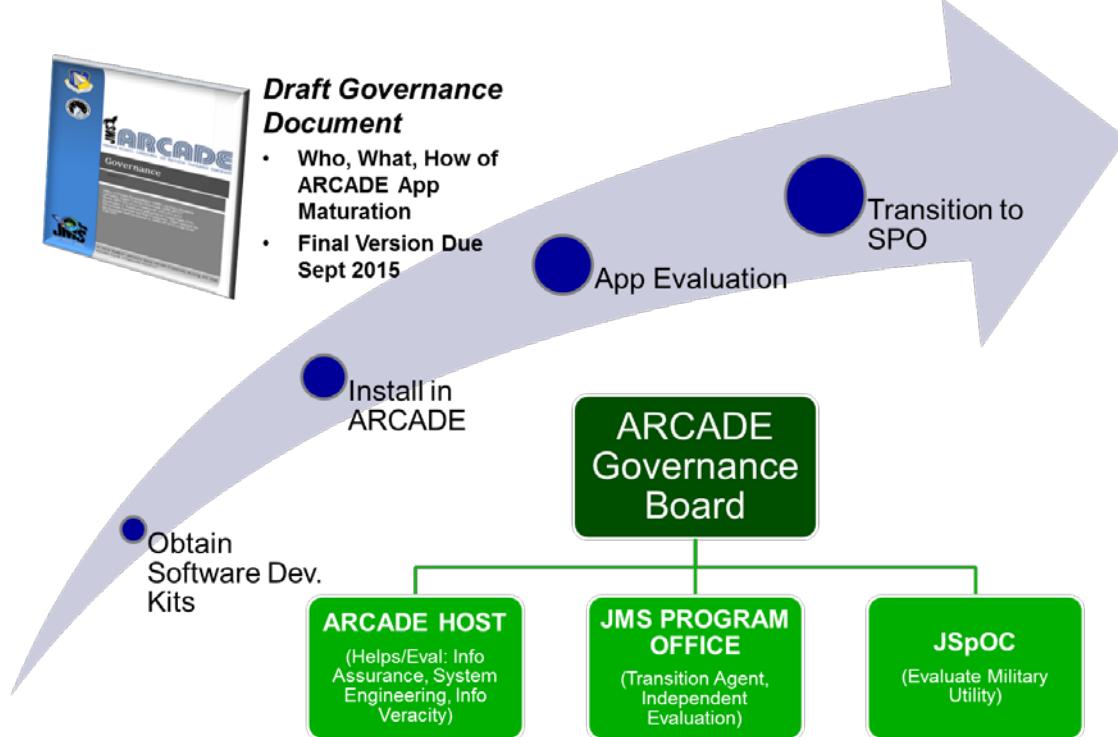


Fig. 8: High-level Diagram of ARCADE Governance

Figure 8 shows the high-level steps: Obtain Software Development Kits, Install in ARCADE, Application Evaluation, and Transition to the Program Office (SPO). Details of the high-level steps toward transition are still being finalized. The details will likely be captured in an ARCADE User's Manual, consistent with the high-level descriptions included as part of the Governance Process. The ARCADE User's Manual is also in draft format currently. Some of the steps are already well fleshed out, for example the Software Development Kits and Installation Processes, both of which are relatively straightforward to define, have been defined as a series of steps with defined expected outcomes. Other parts of the Governance Process, App Evaluation and Transition to SPO, are currently inadequately defined but will be fleshed-out completely before September 2015.

5. ACHIEVING RESPONSIVE CAPABILITY DELIVERY TO JMS

Industry and government entities have clearly identified the need for a common, relevant development environment to support mission application development for the JMS user. Through access to relevant tools and data, JMS will empower the development community to accelerate technology development, define a new business case, lower costs, and identify development areas that support user-identified priorities/requirements. The JMS application development environment will encourage participation by niche application developers and small businesses by removing the need for developers to invest in duplicative, stand-alone infrastructure and facilitating access to test data sources. By providing JMS integration process requirements early in the development process and enabling successful integration into the SOA framework as soon as possible, the environment will flatten the application developers' learning curve.

From the perspective of the end users and SSA experimenters, the JMS ARCADE will allow JSpOC operators to get early exposure to development applications via UDOP-compliant plug-ins that may address needs identified in exercises such as Global Lightning/Terminal Fury. The JMS program office is working closely with SMC/SYE on ops engineering efforts that involve changes to tactics and procedures. ARCADE tools will enable lower tier exercise vignettes to motive quick changes in both technology and CONOPS to happen simultaneously. This would enable early operator feedback to code developers for prototype capability improvements.

Once an application progresses through the utility testing enabled by the development environment, it can finalize its path to SOA integration by entering the SPAWAR JMS integration gating processes and eventually Operational Test & Evaluation. If used properly, the environment will empower users to develop high-impact, high-TRL applications in a timely manner as well as help bridge the gap between development and integration into the operational JMS enterprise by exercising the developed applications in a relevant environment with representative data sets.

6. DEPLOYING THE JMS ARCADE

AFRL/RD and AFRL/RV have moved out with the first phase of the Portal ARCADE and JMS SOA ARCADE environments. The Portal ARCADE is hosted in the Maui High Performance Computing Center; the JMS SOA ARCADE enclave is hosted at AFRL/RV, physically located at Kirtland AFB. All of the described enclaves are accessible through the internet at appropriate classification levels and are issuing ARCADE accounts. Additional capability is planned for delivery by December 2014.

A set of 6 pathfinder applications are currently under development and progressing through the ARCADE maturation process. Equally exciting, in addition to the core-JMS data sources, additional data sources are being integrated to ARCADE. Access to both JMS and additional data sources is key to new application developments.

Currently over 30 ARCADE users have requested and been granted ARCADE accounts, all members of the DoD and US National space community. Many of these ARCADE users are contributing via feedback, to the ARCADE interfaces and software development kits.

The JMS program office will be working closely with AFRL to maintain insight into the progress of these application developments to identify applications for integration into the operational JMS.

7. ACKNOWLEDGEMENTS

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